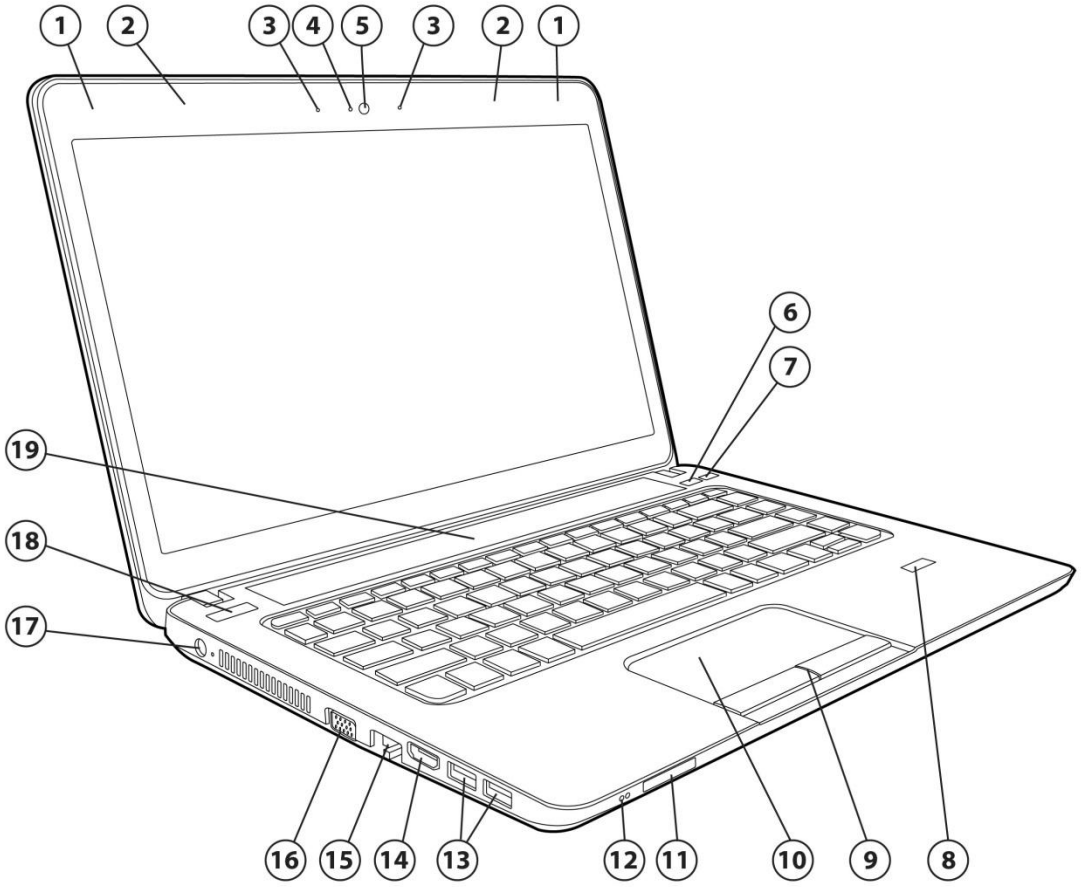
# Overview

## HP ProBook 440 G1 Notebook PC




**Front**

1. WWAN antennas (2)* (select models only)
2. WLAN antennas**
3. Dual-array microphone***
4. Webcam light***
5. Webcam (select model models only)
6. Wireless on/off button
7. Speaker mute button
8. Optional Fingerprint Reader
9. Touchpad pick buttons
10. Touchpad
11. Media Card Reader
12. Hard drive activity LED indicator
13. USB 3.0 ports (2)
14. HDMI port
15. RJ-45 (network) jack
    RJ-45 (network) lights (2)
16. VGA monitor port
17. Power connector
18. Power button
19. Speakers (2)

* The antennas are not visible from the outside of the computer. For optimal transmission, keep the areas immediately around the antennas free from obstructions.

** The number of WLAN antennas in the displays is determined by the WLAN selected

*** Feature is available with select models with webcam configuration.

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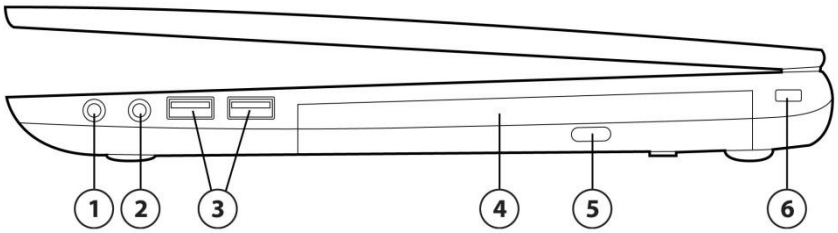
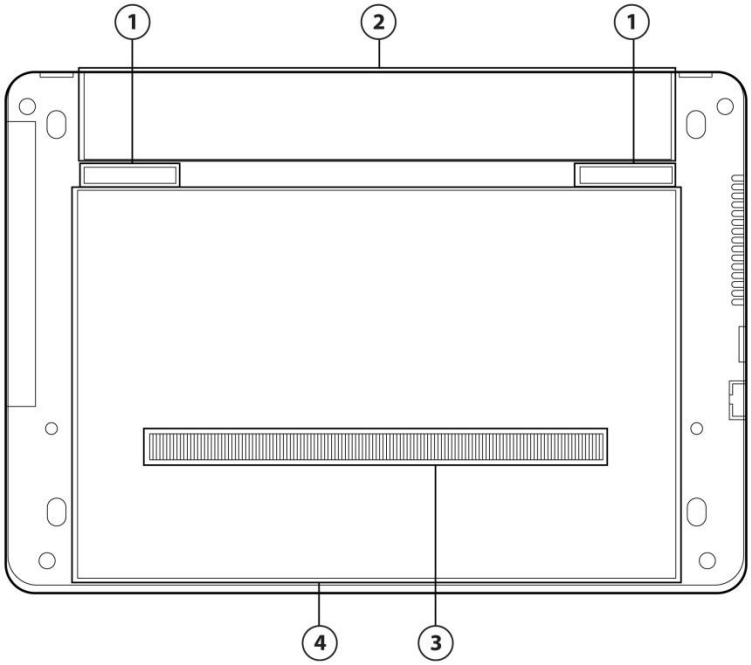



**Right**

1. Audio-out (headphone) jack
2. Audio-in (microphone) jack
3. USB 2.0 ports (2)
4. Optical drive (select models only)
5. Optical drive eject button (select models only)
6. Security lock slot

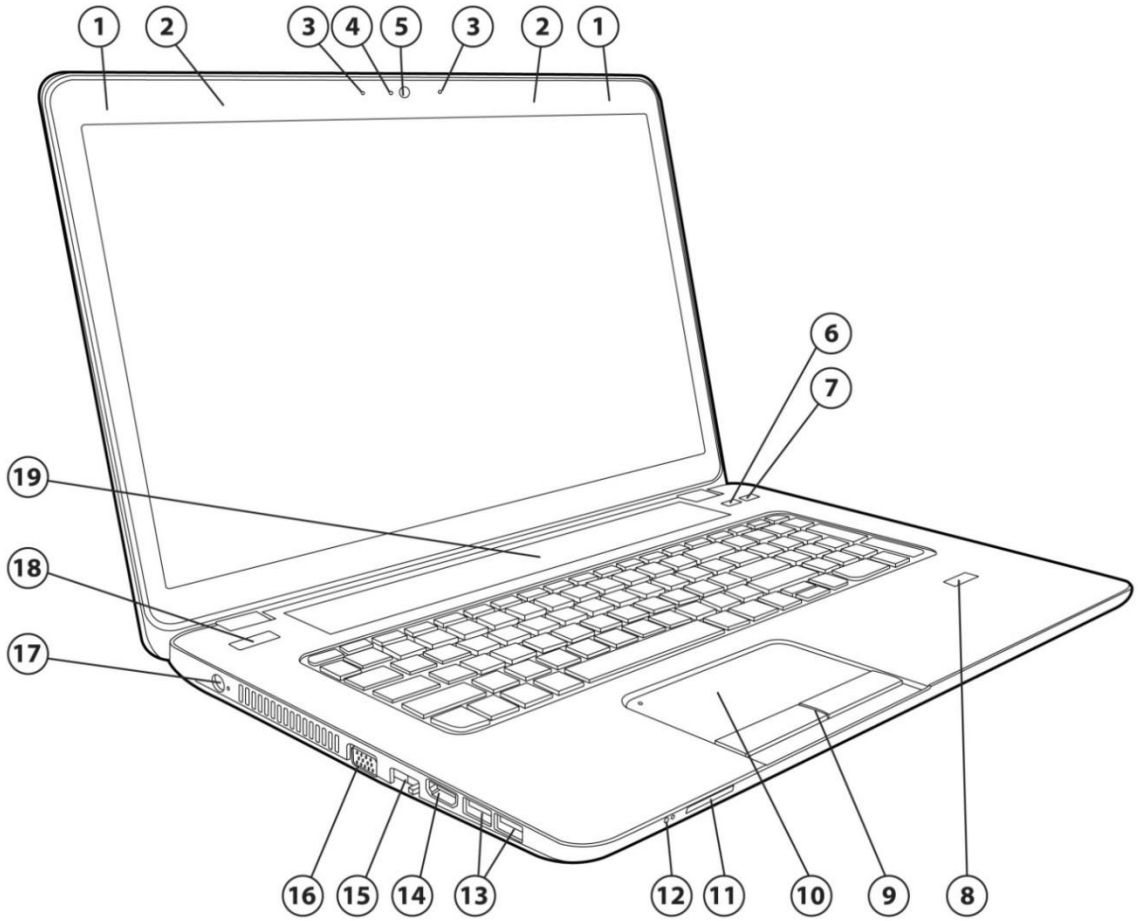



**Bottom**

1. Battery and service door release latches
2. Battery bay
3. Vents
4. Service door

# Overview

## HP ProBook 450 G1 Notebook PC

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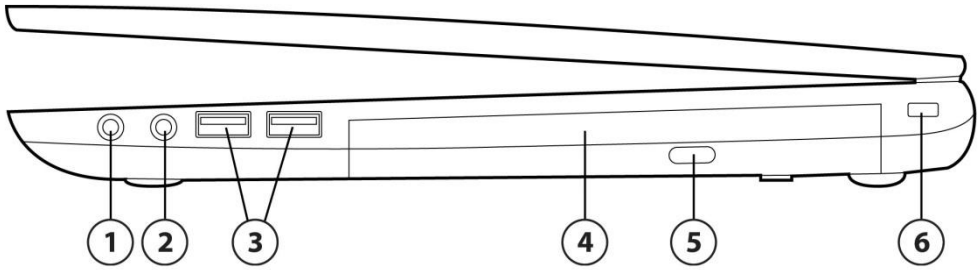


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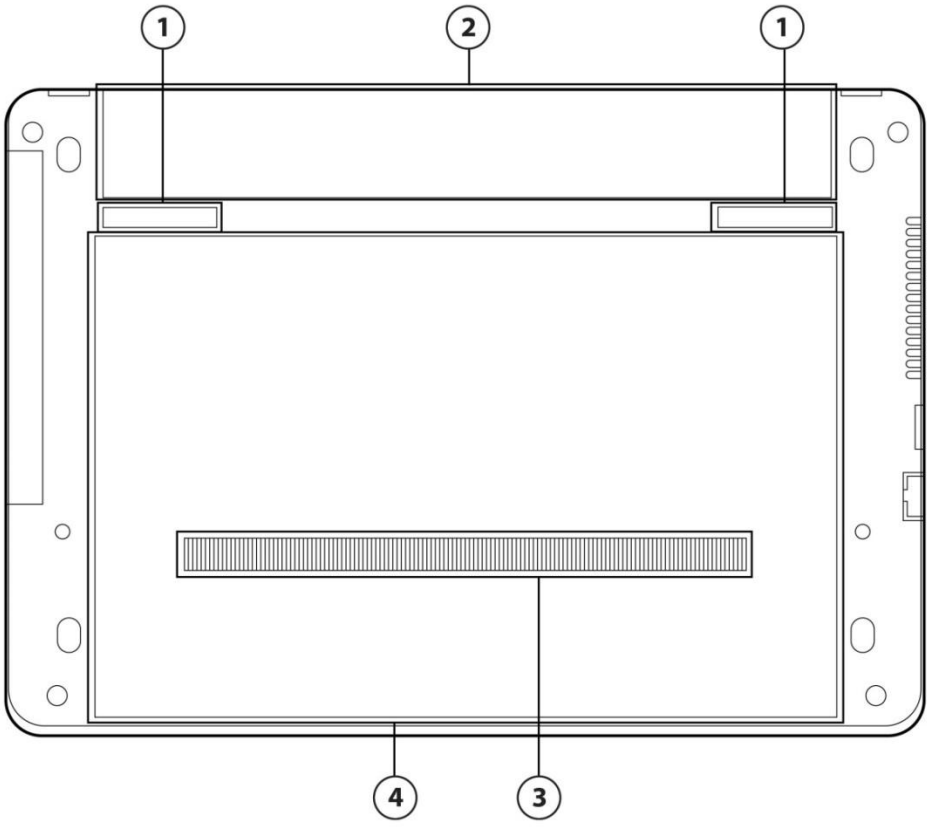


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# Overview

## AT A GLANCE

- Windows 8 versions, Windows 7 versions, SUSE Linux, or FreeDOS
- Aluminum reinforced chassis with multi-layer soft touch paint that keep system looking good longer
- Full-sized spill-resistant keyboard; full separate numeric keypad (HP ProBook 450 only)
- Larger Touchpad with gestures support, on/off button with LED indicator
- Enhanced security features including HP Client Security and optional HP Fingerprint Reader
- Optional HD webcam with dual-microphone array for video conferencing*
- HDMI port for connecting to high-resolution displays; USB 3.0 ports
- DTS Sound+ optimized for high fidelity audio
- Widescreen LED-backlit HD display with 16:9 aspect ratio with available 15.6-inch diagonal HD, 15.6-inch diagonal HD with Touch option (HP ProBook 450), 14-inch diagonal HD (HP ProBook 440)
- Choice of 4th generation Intel® Core™ i7, i5 and i3 processors, Intel Celeron and Pentium processor
- Wireless on/off and speaker mute buttons for convenient management of the connectivity and speaker.
- Flexible wireless connectivity options:
    - Integrated HP Mobile Broadband Module
    - Integrated 802.11 b/g/n wireless LAN module
    - Integrated 802.11 a/b/g/n/AC, a/b/g/n or b/g/n with Bluetooth 4.0 combo card

* Optional on models with integrated graphics only.

**NOTE: See important legal disclosures for all listed specs in their respective features sections.**

# Features

## PRODUCT NAME

HP ProBook 440 G1 Notebook PC
HP ProBook 450 G1 Notebook PC

## OPERATING SYSTEM

**Preinstalled**

Windows 8 Pro 64*
Windows 7 Professional (available through downgrade rights from Windows 8 Pro**
Windows 8 64*
Windows 7 Professional 64***
Windows 7 Home Premium 64***
Windows 7 Home Basic 64***
SUSE Linux Enterprise Desktop 11
FreeDOS

* Not all features are available in all editions of Windows 8. Systems may require upgraded and/or separately purchased hardware, drivers and/or software to take full advantage of Windows 8 functionality. See **http://www.microsoft.com** for details.
** This system is preinstalled with Windows® 7 Pro software and also comes with a license and media for Windows 8 Pro software. You may only use one version of the Windows software at a time. Switching between versions will require you to uninstall one version and install the other version. You must back up all data (files, photos, etc.) before uninstalling and installing operating systems to avoid loss of your data.
*** Not all features are available in all editions of Windows 7. This system may require upgraded and/or separately purchased hardware to take full advantage of Windows 7 functionality. See **http://www.microsoft.com/windows/windows-7/** for details.

## PROCESSOR

4th Generation Intel® Core™ i7-4702MQ (2.2GHz, 6MB L3 cache, 4 cores)
Up to 3.2GHz with Intel Turbo Boost Technology
4th Generation Intel® Core™ i5-4200M (2.5GHz, 3MB L3 cache, 2 cores)
Up to 3.1GHz with Intel Turbo Boost Technology
4th Generation Intel® Core™ i3-4100M (2.5GHz, 3MB L3 cache, 2 cores)
4th Generation Intel® Core™ i3-4000M (2.4GHz, 3MB L3 cache, 2 cores)
Intel® Pentium 3550M (2.3GHz, 2MB L3 cache, 2 cores)
Intel® Celeron 2950M (2.0GHz, 2MB L3 cache, 2 cores)

* Multi-Core is designed to improve performance of certain software products. Not all customers or software applications will necessarily benefit from use of this technology. 64-bit computing on Intel® architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers, and applications enabled for Intel® 64 architecture. Processors will not operate (including 32-bit operation) without an Intel® 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations. Intel's numbering is not a measurement of higher performance.
**NOTE**: Processor speed denotes maximum performance mode; processors will run at lower speeds in battery optimization mode.

## CHIPSET

Mobile Intel® HM87 Express

## GRAPHICS

Integrated*:
Intel HD** Graphics 4600 (4th Generation Intel Quad-Core i7 and Dual-Core i5 and i3)

## Features

Intel HD** Graphics (Celeron and Pentium configurations)
Switchable Discrete:
AMD Radeon™ HD** 8750M, with 1 or 2 GB dedicated DDR3 video memory***
* HP ProBook 440 and 450 only.
** HD content required to view HD images.
*** AMD Dynamic Switchable Graphics technology requires either an AMD "A" series APU or an Intel processor, plus an AMD Radeon™ discrete graphics configuration and is not available on FreeDOS and Linux OS. With AMD Dynamic Switchable Graphics technology, full enablement of all discrete graphics video and display features may not be supported on all systems (e.g. OpenGL applications will run on the integrated GPU or the APU as the case may be).

## DISPLAY

**HP ProBook 440 G1**

**Internal**
14” diagonal LED-backlit HD anti-glare (1366 x 768)
**External**
Up to 32-bit per pixel color depth
**VGA**
Port supports resolutions up to 1920 x 1080 external resolution @60 Hz
**HDMI**
Supports direct connection to high-definition displays with up to 1920 x 1200@60Hz resolution and 7-channel audio with one convenient cable (not included)

**NOTE**: HD content required to view HD images.
**NOTE**: Resolutions are dependent upon monitor capability, and resolution and color depth settings.

**HP ProBook 450 G1**

**Internal**
15.6” diagonal LED-backlit HD anti-glare Touch Display is shatter, scratch, reflection and smudge resistant (1366 x 768)
15.6” diagonal LED-backlit HD anti-glare (1366 x 768)
**External**
Up to 32-bit per pixel color depth
**VGA**
Port supports resolutions up to 1920 x 1080 external resolution @60 Hz
**HDMI**
Supports direct connection to high-definition displays with up to 1920 x 1200@60Hz resolution and 7-channel audio with one convenient cable (not included)

**NOTE:** HD content required to view HD images.
**NOTE:** Resolutions are dependent upon monitor capability, and resolution and color depth settings.

## STORAGE AND DRIVES

**Primary Storage Bay**
**Hard Drives**
320/500/750 GB**/1 TB** 5400 rpm SMART SATA II HDD;
500 GB** 7200 rpm SMART SATA II HDD
500 GB** 5400 rpm SMART SATA II Hybrid HDD/SSHD

**Solid State Drive***

## Features

128 GB** 2.5" Solid State Drive

**HP 3D DriveGuard (Windows only)**
The hard drive is mounted directly to the notebook frame, reducing the transmission of shock to the hard drive

* Available on 450G1 only
**For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 16 GB (for Windows 7) and 36 GB (for Windows 8) of system disk is reserved for the system recovery software.

## OPTICAL DRIVES

**Fixed 9.5 mm SATA optical drive**
Blu-ray ROM DVD+/-RW SuperMulti DL Drive*†
DVD+/-RW SuperMulti DL Drive*
DVD-ROM Drive
No optical drive option

* Sold separately as an optional feature.
† For Blu-ray drives, certain disc, digital connection, compatibility and/or performance issues may arise, and do not constitute defects in the product. Flawless playback on all systems is not guaranteed. In order for some Blu-ray titles to play, they may require an HDMI digital connection and your display may require HDCP support. HD-DVD disks cannot be played on this drive. Note that DVD-RAM cannot read or write to 2.6GB Single Sided/5.2 GB Double Sided – Version 1.0 media. Actual speeds may vary. Don't copy copyright-protected materials. Double Layer discs can store more data than single layer discs; discs burned with this drive may not be compatible with many existing single-layer DVD drives and players.

## MEMORY

**Standard**
DDR3L 1.35V SDRAM (1600 MHz)
Two SODIMM slots supporting dual-channel memory
4 GB and 8 GB SODIMMs*
**Maximum**
Upgradeable to 16384 MB with optional 8192 MB SODIMMs in slots 1 and 2
**Dual-channel**
Maximized dual-channel performance requires SODIMMs of the same size and speed in both memory slots.

**NOTE:** Due to the non-industry standard nature of some third-party memory modules, we recommend HP branded memory to ensure compatibility. If you mix memory speeds, the system will perform at the lower memory speed. With Windows Starter 32-bit operating systems, the amount of usable memory is dependent upon your configuration, so that above 3 GB all memory may not be available due to system resource requirements.

## NETWORKING/COMMUNICATIONS

**Wireless**
Support for a broad range of secure, integrated wireless LAN and wireless WAN options featuring support for the latest industry standards. Broadband Wireless (WWAN) requires a Windows operating system and is available in select countries as a standard, factory configurable feature only. Integrated Bluetooth is also available (factory configurable only) and can be combined with any of the supported wireless LAN and wireless WAN options.

**Broadband Wireless (WWAN)**
HP hs3110 HSPA+ Mobile Broadband Module*
**Wireless LAN (WLAN)****
Realtek 802.11 b/g/n (1x1)**

## Features

Mediatek 802.11 b/g/n (1x1) with Bluetooth v4.0 combo**
Intel Dual Band Wireless-AC 3160 802.11 a/b/g/n/ac (1x1) WiFi with Bluetooth 4.0 combo**, ***
Intel Dual Band Wireless-N 7260AN 802.11 a/b/g/n (2x2) WiFi with Bluetooth 4.0 combo***
**NOTE**: Supports Bluetooth® v2.1 on Linux operating systems

* WWAN is an optional feature sold separately or as an add on feature. WWAN connection requires wireless data service contract, network support, and is not available in all areas. Contact service provider to determine the coverage area and availability. Connection speeds will vary due to location, environment, network conditions, and other factors.
***Wireless access point and Internet service is required and is not included. Availability of public wireless access points limited.
**** The specifications for the 802.11ac WLAN are draft specifications and are not final. If the final specifications differ from the draft specifications, it may affect the ability of the notebook to communicate with other 802.11ac WLAN devices.

**Communications**
Realtek 10/100/1000* Ethernet Controller
* The term "10/100/1000" or "Gigabit" Ethernet indicates compatibility with IEEE standard 802.3ab for Gigabit Ethernet, and does not connote actual operating speed of 1 Gb/s. For high-speed transmission, connection to a Gigabit Ethernet server and network infrastructure is required.

## AUDIO/MULTIMEDIA

**Audio**
DTS Sound+
Integrated stereo speakers
Integrated digital microphone (dual-microphone array when equipped with optional webcam)
Function keys for microphone mute, volume up, volume down
Stereo headphone/line out
Stereo microphone/line in
**Webcam**
Optional* 720p HD** webcam

- HD format (widescreen)
- Supports videoconferencing (non-HD) and still image capture
- High quality fixed focus lens
- Video capture at various resolutions up to 1280x720 resolution (720p) and up to 30fps
- M-JPEG compression supports higher frame rates for video capture and videoconferencing
- Improved low light sensitivity
- Improved dynamic range
- Skype-ready***

* Sold separately as an optional feature.
** HD content required to view HD images.
*** Internet access required.

## KEYBOARDS/POINTING DEVICES/BUTTONS & FUNCTION KEYS

**Keyboard**
The HP spill-resistant keyboard is designed using a thin layer of Mylar film under the keyboard. The 101/102-key compatible keyboard features a full-pitch key layout with desktop keyboard features, such as editing keys, both left and right control and alt keys, and function keys. US and International key layouts are available. Includes a separate numeric keypad (HP ProBook 450 only).
**Pointing Devices**

## Features

Touchpad with gestures support, on/off button with LED indicator, two-way scroll, two pick buttons
**Buttons and Function Keys**
Separate launch buttons provide easy access to wireless on/off and speaker mute. Function keys provide control of features including: standby mode, display brightness, external display, microphone mute, volume down, and volume up.

## SOFTWARE AND SECURITY

**Preinstalled Software with Windows Operating System**
HP Wireless Hotspot*
HP ePrint (HP Exclusive)**
HP Hotkey support
HP 3D DriveGuard (Windows required)
PDF Complete Corporate Edition***
Skype ready ****
HP Recovery Manager
HP Support Assistant
Buy Office
Intel Wireless Display*****
**NOTE:** HP Recovery Manager enables fast recovery of the factory preinstalled image if the system becomes corrupted or if important system files are accidentally deleted. Up to 16 GB (for Windows 7) and 36 GB (for Windows 8) of system disk is reserved for the system recovery software.

* The wireless hotspot application requires an active internet connection and separately purchased data plan. While HP wireless hotspot is active, on-device applications will continue to work and will use the same data plan as the wireless hotspot. Wireless hotspot data usage may incur additional charges. Check with your service provider for plan details. Requires Windows.
** Requires an Internet connection to HP web-enabled printer and HP ePrint account registration (for a list of eligible printers, supported documents and image types and other HP ePrint details, see www.hp.com/go/eprintcenter).Requires optional broadband module. Broadband use requires separately purchased service contract. Check with service provider for coverage and availability in your area. Separately purchased data plans or usage fees may apply. Print times and connection speeds may vary.
*** PDF Complete Corporate Edition includes 50 PDF creations or six months, whichever comes first. Purchase license afterwards for full functionality.
****Skype-ready. Skype is not offered in China.
***** Integrated Intel Wi-Di feature is available on select configurations only and requires separately purchased projector, TV or computer monitor with an integrated or external Wi-Di receiver. External Wi-Di receivers connect to the projector, TV or computer monitor via a standard HDMI cable, also sold separately.

**Security**

**Standard**
HP Client Security (Windows only)
HP Trust Circles Standard (Available in Fall 2013)
Microsoft Security Essentials(Windows 7)/Microsoft Defender (Windows 8)*
HP Drive Encryption**
HP BIOS Protection***
Security lock slot

**Optional**
Intel® Anti-Theft (requires a Computrace subscription)****
Intel Identity Protection*****
HP Fingerprint reader

## Features

**NOTE:** The Absolute Persistence agent is shipped turned off, and must be activated by customers when they purchase a subscription. Subscriptions can be purchased for terms ranging multiple years. Service is limited, check with Absolute for availability outside the U.S.
* Opt in and internet connection required for updates.
** Requires Windows. Data is protected prior to Drive Encryption login. Turning the PC off or into hibernate logs out of Drive Encryption and prevents data access. Drive encryption planned to be available in October 2013.
*** HP Tools partition with an HP BIOS required for automatic recovery.
**** Intel Anti-Theft security is supported on Intel Core i processors and requires a separately purchased Absolute Computrace service subscription and must be activated and configured. Check with Absolute for availability in your country. Intel and HP assume no liability for lost or stolen data and/or systems or any other damages resulting therefrom. See **http://www.intel.com/technology/anti-theft/**.
***** Intel Identity Protection feature is only available with Intel Core Processors. Intel® IPT security requires separate Symantec VIP software service subscription and must be activated and configured. Requires a website that uses Symantec VIP Authentication Service and Microsoft® Windows. Intel® and HP assume no liability for lost or stolen data and/or systems or any other damages resulting therefrom.

For more information on HP security solutions refer to: **http://www.hp.com/go/security**.

## POWER

**Power Supply**

**HP ProBook 440 G1 Notebook PC**
Models with discrete graphics:
External 90W HP Smart AC Adapter
Models with integrated graphics:
External 65W HP Smart AC Adapter
Power cord included is 3.28-foot (1 meter).
Total length including external AC adapter is 9.38 feet (2.86 meter).
HP Fast Charge*

**HP ProBook 450 G1 Notebook PC**
Models with discrete graphics:
External 90W HP Smart AC Adapter
Models with integrated graphics:
External 65W HP Smart AC Adapter
Power cord included is 3.28-foot (1 meter).
Total length including external AC adapter is 9.38 feet (2.86 meter).
HP Fast Charge*

**Primary Battery**
HP 9-cell Lithium-Ion Battery (93 WHr)
HP 6-cell Lithium-Ion Battery (47 WHr)

**Battery Life with Windows 7**

| | Configurations with integrated graphics (Windows 7) | Configurations with discrete graphics (Windows 7) |
|---|---|---|
| **HP ProBook 440** | | |
| **9-cell (93 WHr) battery** | Up to 17 hours 30 mins | Up to 17 hours 30 mins |
| **6-cell (47 WHr) battery** | Up to 9 hours 15 mins | Up to 9 hours |
| **HP ProBook 450** | | |

## Features

| | | |
|---|---|---|
| **9-cell (93 WHr) battery** | Up to 17 hours 15 mins | Up to 17 hours |
| **6-cell (47 WHr) battery** | Up to 9 hours 15 mins | Up to 9 hours |

**System Standby Time****
Up to 12 days

* Windows 7 battery life will vary depending on numerous factors including product model, configuration, loaded applications, features, use, wireless functionality, and power management settings. The maximum capacity of the battery will naturally decrease with time and usage. See **www.bapco.com** for additional details.
** Standby life will vary depending on various factors including battery, Memory, CPU, EC and LAN chip. The maximum capacity of the battery will naturally decrease with time and usage.

**NOTE:** Fast Charge recharges your battery up to 90% within 90 minutes when the system is off (6-cell only).

**Power Conservation**
Supports enhanced Intel SpeedStep technology (allows Battery Optimized Mode, Maximum Performance Mode, or Automatic mode)
AMD PowerPlay technology (discrete models)
Hibernation
Standby
ACPI compliance

## WEIGHTS & DIMENSIONS

**HP ProBook 440 G1 Notebook PC**

**Weight**
Starting at 4.63 lb (2.10 kg) with optical drive (weight will vary by configuration)
Starting at 4.34 lb (1.97 kg) without optical drive (weight will vary by configuration)
**Dimensions** (w x d x h)
13.35 x 9.38 x 0.88 (front) -1.12 in (at rear)
33.92 x 23.85 x 2.24 (front) - 2.86 cm (at rear)

**HP ProBook 450 G1 Notebook PC**

**Weight**
Starting at 5.22 lb (2.37 kg) with optical drive without touch (weight will vary by configuration)
Starting at 4.98 lb (2.26 kg) without optical drive without touch (weight will vary by configuration)
Starting at 5.84 lb (2.65 kg) with optical drive with touch (weight will vary by configuration)
Starting at 5.6 lb (2.54 kg) without optical drive with touch (weight will vary by configuration)

**Dimension** (wxdxh)
14.76x10.09x0.9 (front) – 1.14 in (at rear) (non-Touch)
37.5x25.6x2.28 (front)-2.9 cm (at rear) (non-Touch)
14.76x10.09x0.95(front)-1.20in(at rear) (Touch)
37.5x25.6x2.42(front)-3.04cm(at rear) (Touch)

## PORTS/SLOTS

**Ports**
USB 3.0 – Two

## Features

USB 2.0 – Two
HDMI 1.4a – One
Stereo microphone input – One
Headphone/line out – One
RJ-45 (Ethernet) – One
Power connector – One
VGA - One

**Digital Media Slots**
Multi Media Reader Slot supporting SD, SDHC, SDXC, Memory Stick, MSXC

## SERVICE AND SUPPORT

HP Services offers limited 1-year warranty
1-year limited warranty on primary battery. On-site service and warranty upgrades are also available. HP Care Pack Services extend service contracts beyond the standard warranties. To choose the right level of service for your HP product, use the HP Care Pack Services Lookup Tool at: **http://www.hp.com/go/lookuptool**. Consult the HP Customer Support Center for details. **http://h20000.www2.hp.com/bizsupport/TechSupport/ProductRoot.jsp**.

**NOTE**: Service levels and response times for HP Care Packs may vary depending on your geographic location. Service starts on date of hardware purchase. Restrictions and limitations apply. For details, visit http://www.hp.com/go/cpc.

# Technical Specifications

## SYSTEM UNIT

| | | | |
|---|---|---|---|
| **Stand-Alone Power Requirements** (AC Power) | **Nominal Operating Voltage** | 19 V | |
| | **Average Operating Power** | **Windows 7 (64-bit)** | **Windows8 (64-bit)** |
| | ProBook 440 Integrated graphics | 8.81 W | 9.08 W |
| | ProBook 440 Discrete graphics | 9.38 W | 9.65 W |
| | ProBook 450 Integrated graphics | 8.8 W | 8.7 W |
| | ProBook 450 Discrete graphics | 9.68 W | 9.22 W |
| | ProBook 470 Discrete graphics | 9.55 W | 9.88 W |
| | **Max Operating Power** | Discrete < 90W<br>UMA < 65W | |
| **Temperature** | **Operating** | 32° to 95° F (0° to 35° C) (not writing optical)<br>41° to 95° F (5° to 35° C) (writing optical) | |
| | **Non-operating** | -4° to 140° F (-20° to 60° C) | |
| **Relative Humidity** | **Operating** | 10% to 90%, non-condensing | |
| | **Non-operating** | 5% to 95%, 101.6° F (38.7° C) maximum wet bulb temperature | |
| **Shock** | **Operating** | 40 G, 2 ms, half-sine | |
| | **Non-operating** | 200 G, 2 ms, half-sine | |
| **Random Vibration** | **Operating** | 0.75 grms | |
| | **Non-operating** | 1.50 grms | |
| **Altitude** (unpressurized) | **Operating** | -50 to 10,000 ft (-15.24 to 3,048 m) | |
| | **Non-operating** | -50 to 40,000 ft (-15.24 to 12,192 m) | |
| **Planned Industry Standard Certifications** | **UL** | Yes | |
| | **CSA** | Yes | |
| | **FCC Compliance** | Yes | |
| | **ENERGY STAR®** | Select models* | |
| | **EPEAT** | Registered Gold in United States** | |
| | **ICES** | Yes | |
| | **Australia / NZ A-Tick Compliance** | Yes | |
| | **CCC** | Yes | |
| | **Japan VCCI Compliance** | Yes | |
| | **KC** | Yes | |
| | **BSMI** | Yes | |
| | **CE Marking Compliance** | Yes | |
| | **BNCI or BELUS** | Yes | |
| | **CIT** | Yes | |
| | **GOST** | Yes | |
| | **Saudi Arabian Compliance (ICCP)** | Yes | |
| | **SABS** | Yes | |
| | **UKRSERTCOMPUTER** | Yes | |

* Configurations of the HP ProBook 440 G1 and HP ProBook 450 G1 that are ENERGY STAR® qualified are identified as HP ProBook 440 G1 ENERGY STAR and HP ProBook 450 G1 ENERGY STAR on HP websites and on **www.energystar.gov**.
** EPEAT® registration varies by country. See **www.epeat.net** for registration status by country.
EPEAT status listed above applies to U.S.

For accessibility information on HP products, please visit: **http://www.hp.com/accessibility**.

## DISPLAYS

## Technical Specifications

| | | | |
|---|---|---|---|
| **14.0-inch LED HD (1366 x 768) anti-glare** | **Dimensions** (W x H) | 12.63 x 7.39 in (32.09 x 18.76 cm) | |
| | **Weight** | 320g max. | |
| | **Diagonal Size** | 14.0 in (35.6cm) | |
| | **Surface Treatment** | Anti-glare | |
| | **Contrast Ratio** | 400:1 (typical) | |
| | **Refresh Rate** | 60 Hz | |
| | **Brightness** | 200 nit (typical) | |
| | **Pixel Resolution** | **Pitch** | 0.227 mm |
| | | **Format** | 1366 x 768 |
| | | **Configuration** | RGB Stripe |
| | **Backlight** | LED | |
| | **PPI** | 112 ppi | |
| | **Viewing Angle** | ±30° Horizontal, ±10° Vertical (minimum)<br>30/30/20/10 (Left/Right/Down/Up) (minimum) or<br>45/45/35/25 (Left/Right/Down/Up) (typical) | |
| **15.6-inch LED HD (1366 x 768) anti-glare with Touch** | **Dimensions** (W x H) | 13.54 x 7.64 in (34.39 x 19.41 cm) | |
| | **Weight** | 500g max. | |
| | **Diagonal Size** | 15.6 in (39.6cm) | |
| | **Surface Treatment** | Anti-glare | |
| | **Contrast Ratio** | 300:1 (min) | |
| | **Refresh Rate** | 60 Hz | |
| | **Brightness** | 200 nit (typical) | |
| | **Pixel Resolution** | **Pitch** | 0.252 x 0.252 |
| | | **Format** | 1366 x 768 |
| | | **Configuration** | RGB Stripe |
| | **Backlight** | LED | |
| | **PPI** | 106 ppi | |
| | **Viewing Angle** | ±30° Horizontal, ±10° Vertical (minimum)<br>30/30/20/10 (Left/Right/Down/Up) (minimum) or<br>45/45/35/25 (Left/Right/Down/Up) (typical) | |
| **15.6-inch LED HD (1366 x 768) anti-glare** | **Dimensions** (W x H) | 14.17 x 8.83 in (36.0 x 22.43 cm) | |
| | **Weight** | 500g max. | |
| | **Diagonal Size** | 15.6 in (39.6cm) | |
| | **Surface Treatment** | Anti-glare | |
| | **Contrast Ratio** | 400:1 (min) | |
| | **Refresh Rate** | 60 Hz | |
| | **Brightness** | 200 nit (typical) | |
| | **Pixel Resolution** | **Pitch** | 0.252 mm |
| | | **Format** | 1366 x 768 |
| | | **Configuration** | RGB Stripe |
| | **Backlight** | LED | |

| | | | |
|---|---|---|---|
| | **PPI** | 106 ppi | |
| | **Viewing Angle** | ±30° Horizontal, ±10° Vertical (minimum)<br>30/30/20/10 (Left/Right/Down/Up) (minimum) or<br>45/45/35/25 (Left/Right/Down/Up) (typical) | |
| **17.3-inch LED HD+ anti-glare** | **Active Area** (W x H) | 15.0 x 8.5 in (38.2 x 21.5 cm) | |
| | **Weight** | 570g max. | |
| | **Diagonal Size** | 17.3 in (43.9 cm) | |
| | **Surface Treatment** | Anti-glare | |
| | **Contrast Ratio** | 400:1 typical | |
| | **Refresh Rate** | 60 Hz | |
| | **Brightness** | 200 nit typical | |
| | **Pixel Resolution** | **Pitch** | 0.23868 x 0.23868 mm |
| | | **Format** | 1600 x 900 |
| | | **Configuration** | RGB Stipe |
| | **Backlight** | LED | |
| | **PPI** | 106 | |
| | **Viewing Angle** | ±30° Horizontal, ±10° Vertical (minimum)<br>30/30/20/10 (Left/Right/Down/Up) (minimum) or<br>45/45/35/25 (Left/Right/Down/Up) (typical) | |

## STORAGE AND DRIVES

| | | | |
|---|---|---|---|
| **Internal Storage** | | | |
| **500 GB* 7200 rpm SATA Hard Drive** | **Drive Weight** | 0.25 lbs (115g) | |
| | **Capacity** | 500 GB | |
| | **Height** | 0.37 in (9.5 mm) | |
| | **Width** | 2.75 in (70 mm) | |
| | **Interface** | ATA-8, SATA 2.6, 3.0 Gb/s, NCQ | |
| | **Transfer Rate** | **Synchronous** (maximum) | 300 MB/s (Drive Capability) |
| | **Seek Time** (typical reads, including settling) | **Single Track** | 1.5 ms |
| | | **Average** | 11 ms |
| | | **Maximum** | 22 ms |
| | **Rotational Speed** | 7200 rpm | |
| | **Logical Blocks** | 976,773,168 | |
| | **Operating Temperature** | 32° to 140° F (0° to 60° C) [case temp] | |
| | **Features** | ATA Security | |
| **320 GB* 5400rpm rpm SATA Hard Drive** | **Drive Weight** | 0.25 lbs (115 g) | |
| | **Capacity** | 320 GB | |
| | **Height** | 0.37 in (9.5 mm) | |
| | **Width** | 2.75 in (70 mm) | |

## Technical Specifications

| | | | |
|---|---|---|---|
| | **Interface** | ATA-8, SATA 2.6, 3.0 Gb/s, NCQ | |
| | **Transfer Rate** | **Synchronous** (maximum) | 300 MB/s (Drive Capability) |
| | **Seek Time** (typical reads, including settling) | **Single Track** | 1.5 ms |
| | | **Average** | 11 ms |
| | | **Maximum** | 22 ms |
| | **Rotational Speed** | 7200 rpm | |
| | **Logical Blocks** | 625,142,448 | |
| | **Operating Temperature** | 32° to 140° F (0° to 60° C) [case temp] | |
| | **Features** | ATA Security | |
| **500 GB* 5400 rpm SATA Hard Drive** | **Drive Weight** | 0.22 lb (101 g) | |
| | **Capacity** | 500 GB | |
| | **Height** | 0.37 in (9.5 mm) | |
| | **Width** | 2.75 in (70 mm) | |
| | **Interface** | ATA-8, SATA 2.6, 3.0 Gb/s, NCQ | |
| | **Transfer Rate** | **Synchronous** (maximum) | 300 MB/s (Drive Capability) |
| | **Seek Time** (typical reads, including settling) | **Single Track** | 3 ms |
| | | **Average** | 13 ms |
| | | **Maximum** | 24 ms |
| | **Rotational Speed** | 5400 rpm | |
| | **Logical Blocks** | 976,773,168 | |
| | **Operating Temperature** | 32° to 140° F (0° to 60° C) [case temp] | |
| | **Features** | ATA Security | |
| **750 GB* 5400 rpm SATA Hard Drive** | **Drive Weight** | 0.22 lb (101 g) | |
| | **Capacity** | 750 GB | |
| | **Height** | 0.37 in (9.5 mm) | |
| | **Width** | 2.75 in (70 mm) | |
| | **Interface** | ATA-8, SATA 2.6, 3.0 Gb/s, NCQ | |
| | **Transfer Rate** | **Synchronous** (maximum) | 300 MB/s (Drive Capability) |
| | **Seek Time** (typical reads, including settling) | **Single Track** | 3 ms |
| | | **Average** | 13 ms |
| | | **Maximum** | 24 ms |
| | **Rotational Speed** | 5400 rpm | |
| | **Logical Blocks** | 1,465,149,168 | |
| | **Operating Temperature** | 32° to 140° F (0° to 60° C) [case temp] | |
| | **Features** | ATA Security | |
| **1 TB* 5400 rpm SATA Hard Drive** | **Drive Weight** | 0.254 lb (115 g) | |
| | **Capacity** | 1 TB | |
| | **Height** | 0.37 in (9.5 mm) | |
| | **Width** | 2.75 in (70 mm) | |
| | **Interface** | ATA-8, SATA 2.6, 3.0 Gb/s, NCQ | |
| | **Transfer Rate** | **Synchronous** (maximum) | 300 MB/s (Drive Capability) |
| | **Seek Time** (typical reads, including settling) | **Single Track** | 3 ms |
| | | **Average** | 13 ms |
| | | **Maximum** | 24 ms |
| | **Rotational Speed** | 5400 rpm | |

## Technical Specifications

| | | | |
|---|---|---|---|
| | **Logical Blocks** | 1,953,525,168 | |
| | **Operating Temperature** | 32° to 140° F (0° to 60° C) [case temp] | |
| | **Features** | ATA Security | |
| **500 GB* 5400 rpm SMART SATA II Hybrid HDD/SSHD** | **Drive Weight** | 0.209 lb (95 g) | |
| | **Capacity** | 500 GB | |
| | **Height** | 0.276 in (7 mm) | |
| | **Width** | 2.76 in (70.1 mm) | |
| | **Interface** | ATA-8, SATA 2.6, 6.0 Gb/s, NCQ | |
| | **Transfer Rate** | **Synchronous** (maximum) | 600 MB/s (Drive Capability) |
| | **Seek Time** (typical reads, including settling) | **Single Track** | 2 ms |
| | | **Average** | 12 ms |
| | | **Maximum** | NIL ms |
| | **Rotational Speed** | 5400 rpm | |
| | **Logical Blocks** | 976,773,168 | |
| | **Operating Temperature** | 32° to 140° F (0° to 60° C) [case temp] | |
| | **Features** | ATA Security | |
| **SATA 6 Gb/s 128 GB*, 2.5-inch Solid State Drive** | **Drive Weight** | 73 Grams | |
| | **Capacity** | 128 GB | |
| | **Height** | 0.276 in (7 mm) | |
| | **Width** | 2.76 in (70 mm) | |
| | **Interface** | SATA 3 (6 Gb/s) | |
| | **Performance** | **Maximum Sequential Read** | **Maximum Sequential Write** |
| | | 415 MB/s | 175 MB/s |
| | **Logical Blocks** | 250,069,680 | |
| | **Operating Temperature** | 32° to 158°F (0° to 70°C) [case temp] | |
| | **Features** | ATA Security; ATA-8; SATA 3.0; DIPM; TRIM | |

* For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 16 GB (for Windows 7) and 36 GB (for Windows 8) of system disk is reserved for the system recovery software.

| | | | |
|---|---|---|---|
| **Optical Drives** | | | |
| **DVD+/-RW SuperMulti DL Drive** | **Access Times** | Random | <140ms CD (typical) |
| | | | < 160 ms DVD (typical) |
| | **Weight** | 170g max. | |
| | **Max Data Transfer Rate** | 24X CD-ROM | |
| | | 8X DVD | |
| | | 24X CD-R | |
| | | 24X CD-RW | |
| | | 8X DVD+R | |
| | | 8X DVD+RW | |
| | | 8X DVD-R | |
| | | 6X DVD-RW | |

| | | | |
|---|---|---|---|
| | | 6X - DVD+R Dual Layer | |
| | | 6X - DVD-R Dual Layer | |
| | | 5X DVD-RAM | |
| | **Transfer Mode** | UDMA Mode 5 | |
| | **Interface** | Gen 1 SATA | |
| | **Supported Media** (read) | CD-DA, CD-TEXT, CD-ROM, CD-ROM XA, MIXED MODE CD, CD-I, CD-I Bridge (Photo-CD, Video CD), Multisession CD (Photo-CD, CD-EXTRA, Portfolio, CD-R, CD-RW), CD-R, CD-RW, DVD-ROM (DVD-5, DVD-9, DVD-10, DVD-18), DVD-R, DVD-RW, DVD+R, DVD+RW, DVD-RAM | |
| | **Supported Media** (write) | CD-R, CD-RW, DVD+R, DVD+RW, DVD-R, DVD-RW, DVD-RAM, DVD+R DL, DVD-R DL | |
| | **Max Media Capacity** (read) | 8.5 GB | |
| | **Max Media Capacity** (write) | 8.5 GB | |
| | **Transport** | Tray Loading | |
| **Blu-ray ROM DVD+/-RW SuperMulti DL Drive** | **Access Times** | Random | <190 ms CD-ROM (typical) |
| | | | < 180ms DVD-ROM (typical) |
| | | | <230 ms BD-ROM (typical) |
| | **Weight** | 170g max. | |
| | **Max Data Transfer Rate** | 24X CD-ROM | |
| | | 8X DVD-ROM | |
| | | 24X CD-R | |
| | | 16X CD-RW | |
| | | 8X DVD+R | |
| | | 8X DVD+RW | |
| | | 8X DVD-R | |
| | | 6X DVD-RW | |
| | | 4X - DVD+R Dual Layer | |
| | | 4X - DVD-R Dual Layer | |
| | | 5X DVD-RAM | |
| | | 6X BD-ROM | |
| | **Transfer Mode** | UDMA Mode 5 | |
| | **Interface** | Gen 1 SATA | |
| | **Supported Media** (read) | CD-DA, , CD-TEXT, CD-ROM, CD-ROM XA, MIXED MODE CD, CD-I, CD-I Bridge (Photo-CD, Video CD), Multisession CD (Photo-CD, CD-EXTRA, Portfolio, CD-R, CD-RW), CD-R, CD-RW, DVD-ROM (DVD-5, DVD-9, DVD-10, DVD-18), DVD-R, DVD-RW, DVD+R, DVD+RW. DVD-RAM, BD-ROM, BD-R, BD-RE | |
| | **Supported Media** (write) | CD-R, CD-RW, DVD+R, DVD+R DL, DVD+RW, DVD-R, DVD-R DL, DVD-RW, | |

| | | |
|---|---|---|
| | | DVD-RAM |
| | **Max Media Capacity** (read) | 50.0 GB |
| | **Max Media Capacity** (write) | 8.5GB |
| | **Transport** | Tray Loading |

## SECURITY

| | | |
|---|---|---|
| **HP Fingerprint Reader** (optional) | **Mobile Voltage Operation** | 3.0V-3.6V Single Supply |
| | **Weight** | TBD |
| | **Operating Temperature** | 32° – 158°F (0° – 70°C) |
| | **Current Consumption @ 3.3V** | Less than 70 mA peak imaging and scrolling<br>Less than 25 mA hardware finger detection<br>Advanced Power Management |
| | **High-Rate Image Capture** | Up to 240 image frames /sec |
| | **ESD Resistance** | IEC 61000-4-2 Level 4 (±15KV) |
| | **Detection Matrix** | 192 x 16 Pixels<br>9.7 mm x 0.81 mm<br>500 ppi High-Resolution Images |

## NETWORKING/COMMUNICATIONS

| | | |
|---|---|---|
| **Integrated Realtek RTL8151FH-CG 10/100/1000 NIC** | **Ethernet Features** | 10 Mbit/s operation (10BASE-T; IEEE 802.3i; IEEE 802.3 clauses 13-14)<br>100 Mbit/s operation (100BASE-TX; IEEE 802.3u; IEEE 802.3 clauses 21-30)<br>1000 Mbit/s operation (1000BASE-T; IEEE 802.3ab; IEEE 8023 clauses 40)<br>Auto-Negotiation (Automatic Speed Selection)<br>Full Duplex Operation at all Speeds, Half Duplex operation at 10 and 100 Mbit/s<br>IEEE 802.1p QoS (Quality of Service) Support<br>IEEE 802.1q VLAN support<br>IEEE 802.3x Flow Control (IEEE 802.3 clauses 31-32; configurable)<br>IEEE 802.3az EEE (Energy Efficient Ethernet)<br>Jumbo Frame 9K<br>Auto MDI/MDIX Crossover cable detection |
| | **Weight** | TBD |
| | **Power Management** | ACPI compliant - multiple power modes<br>Situation-sensitive features reduce power consumption<br>Advanced link down power saving for reducing link down power consumption |
| | **Performance Features** | TCP/IP/UDP Checksum Offload (configurable)<br>Protocol Offload (ARP & NS)<br>Large send offload and Giant send offload<br>Receiving Side Scaling |
| | **Manageability** | Wake-on-LAN from standby and hibernation (Magic Packet and Microsoft Wake-Up Frame); Wake-on-LAN from off (Magic Packet only) |

## Technical Specifications

| | | |
|---|---|---|
| | | PXE 2.1 Remote Boot<br>Statistics Gathering (SNMP MIB II, Ethernet-like MIB, Ethernet MIB (802.3x, clause 30))<br>Comprehensive diagnostic and configuration software suite<br>Virtual Cable Doctor for Ethernet cable status |
| | **Interface** | PCI Express 1.1 x1 to fully support ASPM L0s/L1 and CLKREQ |
| | **NIC Device Driver Name** | Realtek PCIe GBE Ethernet Family Controller |
| **HP hs3110 HSPA+ Mobile Broadband Module*** | **Technology/Operating Bands** | CDMA/1xRTT/EvDO: 800MHz (Cell), 1900MHz (PCS)<br>GSM/GPRS/EDGE: 850MHz (Cell), 900MHz (EGSM), 1800MHz (DCS), 1900MHz (PCS)<br>UMTS/WCDMA with receive diversity: 2100MHz (UTRA FDD Band I), 1900MHz (UTRA FDD Band II), 900MHz (UTRA FDD Band VIII), 850 MHz (UTRA FDD Band V)<br>LTE: 700 MHz (Verizon, Band XIII) |
| | **Mobile Operator** | Verizon (US only) |
| | **Wireless Protocol Standards** | GSM/GPRS/EDGE: Class B, Multi-slot class 10 operation, coding schemes CS1 - CS4 and MSC1 - MSC9.<br>CDMA: 1xEVDO Release 0 and Release A, IS-95A, IS-95B, IS-856, IS-2000<br>UMTS/WCDMA: Release 99 and Release 7<br>LTE: Power Class III as per 3GPP TS 36.101 |
| | **Wireless Parametric Standards** | Complies with 3GPP specifications Release 8 for LTE |
| | **Maximum Data Rates** | EvDO (Revision A) - 3.1 Mbps (Download), 1.8 Mbps (Upload)<br>WCDMA (DC-HSPA+) - 42Mbps (Download)<br>LTE (Category 3) - 100 Mbps (Download ), 50Mbps (Upload) |
| | **GPS** | Standalone, Assisted, XTRA |
| | **GPS Bands** | 1575.42 MHz (± 1.023 MHz) |
| | **Maximum Output Power** | GSM/GPRS/EDGE: 32dBm (+/-1)<br>WCDMA: 24dBm (+0.7/-2.3)<br>LTE: +23 dBm (+2.7 dBm/-1.7 dBm)<br>1xRTT/EvDO: +24 dBm (+0.5 dBm/-1.5 dBm) |
| | **Maximum Power Consumption** | 2700mA (peak) |
| | **Power Consumption, Sleep Mode** | 10 mA |
| | **Power Management** | USB selective suspend<br>Integrated notebook wireless button |
| | **Antenna Type** | Dual high efficiency 6 band antennae with spatial diversity, mounted in the display enclosure |
| | **Form Factor** | PCI-Express MiniCard, USB 2.0 interface |
| | **Weight** | < 10 g |
| | **Dimensions** (Length x Width x Thickness) | 2.01 x 1.18 x 0.18 in (51 x 30 x 4.5 mm) |
| | **Voltage, Operating** | 3.3v +/- 9% |
| | **Temperature, Operating** | -4° to 149° F (-20° to 65° C) |
| | **Temperature, Non-operating, 96 hours** (from | -40° to 185° F (-40° to 85° C) |

| | | |
|---|---|---|
| | MIL-STD 202 Method 108) | |
| | **Humidity, Non-operating** | 85% relative humidity for 48 hours @ 185° F (85° C) (non-condensing) |
| | **LED Activity** | LED Off - Radio Off;<br>Solid LED On - Radio On |

* Mobile Broadband is an optional feature sold separately or as an add on feature. Connection requires wireless data service contract, network support, and is not available in all areas. Contact service provider to determine the coverage area and availability. Connection speeds will vary due to location, environment, network conditions, and other factors.

| | | |
|---|---|---|
| **Realtek 802.11 b/g/n (1x1)*** | **Wireless LAN Standards** | IEEE 802.11b<br>IEEE 802.11g<br>IEEE 802.11n |
| | **Interoperability** | Wi-Fi certified |
| | **Frequency Band** | 2.402 – 2.482 GHz |
| | **Data Rates** | 802.11b: 1, 2, 5.5, 11 Mbps<br>802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps<br>802.11n: card will support rates for NSS=1 for RX and TX for 20 MHz channels. Short and long guard interval will be supported. |
| | **Modulation** | Direct Sequence Spread Spectrum<br>BPSK, QPSK, CCK, 16-QAM, 64-QAM |
| | **Security**[1] | IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only<br>AES-CCMP: 128 bit in hardware 802.1x authentication types WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES.<br>WPA2 certification<br>IEEE 802.11i<br>Cisco Certified Extensions, all versions through V5<br>WAPI |
| | **Network Architecture** | Ad-hoc (Peer to Peer) |
| | **Models** | Infrastructure (Access Point Required) |
| | **Roaming** | IEEE 802.11 compliant roaming between access points |
| | **Output Power**[2] | 13.5 dBm, nominal |
| | **Power Consumption** | Transmit: 2.0 W (max)<br>Receive: 1.6 W (max)<br>Associated to Access Point, Idle: 250 mW nominal<br>Wireless Button Off: 100 mW nominal<br>Radio disabled: 75 mW nominal |
| | **Power Management** | ACPI compliant power management<br>802.11 compliant power saving mode |
| | **Receiver Sensitivity**[3] | 802.11b:-95 dBm (1 Mbps), -93 dBm (2 Mbps), -91 dBm (5.5 Mbps), -88 dBm (11 Mbps)<br><br>802.11g:-90 dBm (6 Mbps), -89 dBm (9 Mbps), -87 dBm (12 Mbps), -85 dBm (18 Mbps), -82 dBm (24 Mbps), -79 dBm (36 Mbps), -76 dBm (48 Mbps), -74 dBm (54 Mbps)<br><br>802.11n:-70dBm (72.2 Mbps) |
| | **Antenna type** | High efficiency antenna with spatial diversity, mounted in the display enclosure |

## Technical Specifications

| | | |
|---|---|---|
| **Form Factor** | PCI-Express Half-MiniCard | |
| **Dimensions** | 0.19 x 1.06 x 1.18 in (4.75 x 26.8 x 30 mm) | |
| **Operating Voltage** | 3.3v +/- 9% | |
| **Temperature** | Operating | 14° to 158° F (–10° to 70° C) |
| | Non-operating | –40° to 176° F (–40° to 80° C) |
| **Humidity** | Operating | 10% to 90% (non-condensing) |
| | Non-operating | 5% to 95% (non-condensing) |
| **Altitude** | Operating | 0 to 10,000 ft (3,048 m) |
| | Non-operating | 0 to 50,000 ft (15,240 m) |
| **LED Activity** | LED Off – Radio OFF; Solid LED On – Radio ON | |

1. Check latest software/driver release for updates on supported security features.
2. Maximum output power may vary by country according to local regulations.
3. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CKK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).

* Wireless access point and internet service required. Availability of public wireless access points limited.

| | | |
|---|---|---|
| **Mediatek 802.11 b/g/n (1x1) with Bluetooth® v4.0 combo*** | **Wireless LAN Standards** | IEEE 802.11b<br>IEEE 802.11g<br>IEEE 802.11n |
| | **Interoperability** | Wi-Fi certified |
| | **Frequency Band** | 2.402 – 2.482 GHz |
| | **Data Rates** | 802.11b: 1, 2, 5.5, 11 Mbps<br>802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps<br>802.11n: card will support rates for NSS=1 for RX and TX for 20 MHz channels. Short and long guard interval shall be supported. |
| | **Modulation** | Direct Sequence Spread Spectrum<br>BPSK, QPSK, CCK, 16-QAM, 64-QAM |
| | **Security[1]** | Support for WPA and WPA2<br>Support for CCX version up to and including CCXv5<br>Support for the following EAP types: EAP-TLS, EAP-PEAPv0, EAP-PEAPv1, EAP-PEAPv2, EAP-FAST, EAP-SIM<br>Support for using both machine and user credentials in a single profile. The same profile must be able to be used both before user login and after user login<br>Support the use of Windows Domain credentials<br>IP provider shall have support for an auto-logon to Windows using a PLC and LEAP via the IP provider UI (http://support.microsoft.com/default.aspx/kb/315231).<br>Must have Windows Single Sign On support so that customers can use the WLAN as their primary domain network. With regard to SSO, network association and authentication must occur and be successful before Windows domain authentication is attempted<br>Support for use of the UI client in a user account with limited local security privileges<br>Client service / profile manager must support the WiFi Alliance's WiFi Protected Setup specification. |

| | | |
|---|---|---|
| | Any credentials saved in a profile must be done securely such that they cannot be re-used by any other user or machine. | |
| **Network Architecture** | Ad-hoc (Peer to Peer) | |
| **Models** | Infrastructure (Access Point Required) | |
| **Roaming** | IEEE 802.11 compliant roaming between access points | |
| **Output Power**[2] | 2.4G:+13.5dBm, minimum | |
| **Power Consumption** | Transmit: 2.0 W (max) | |
| | Receive: 1.6 W (max) | |
| | Associated to Access Point, Idle: 250 mW nominal (WLAN Associated) | |
| | Wireless Button Off: 100 mW nominal (WLAN unassociated) | |
| | Radio disabled: 75 mW nominal | |
| **Power Management** | ACPI and PCI Express compliant power management | |
| | 802.11 compliant power saving mode | |
| **Receiver Sensitivity**[3] | 802.11b:-95 dBm (1 Mbps), -93 dBm (2 Mbps), -91 dBm (5.5 Mbps), -88 dBm (11 Mbps) | |
| | 802.11g:-90 dBm (6 Mbps), -89 dBm (9 Mbps), -87 dBm (12 Mbps), -85 dBm (18 Mbps), -82 dBm (24 Mbps), -79 dBm (36 Mbps), -76 dBm (48 Mbps), -74 dBm (54 Mbps) | |
| | 802.11n:-70dBm (72.2 Mbps) | |
| **Antenna type** | Two embedded single band 2.4 antennas | |
| **Form Factor** | PCI-Express Half-MiniCard | |
| **Dimensions** | 0.19 x 1.06 x 1.18 in (4.75 x 26.8 x 30 mm) | |
| **Operating Voltage** | 3.3v +/- 9% | |
| **Temperature** | Operating | 14° to 158° F (–10° to 70° C) |
| | Non-operating | –40° to 176° F (–40° to 80° C) |
| **Humidity** | Operating | 10% to 90% (non-condensing) |
| | Non-operating | 5% to 95% (non-condensing) |
| **Altitude** | Operating | 0 to 10,000 ft (3,048 m) |
| | Non-operating | 0 to 50,000 ft (15,240 m) |
| **LED Activity** | LED Off – Radio OFF; Solid LED On – Radio ON | |

1. Check latest software/driver release for updates on supported security features.
2. Maximum output power may vary by country according to local regulations.
3. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CKK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).

**Bluetooth Specification**

V4.0 High Speed, V2.1+EDR, backwards compatible with V1.1, 1.2 and 2.0

| | |
|---|---|
| **Number of Available Channels** | 79 (1 MHz) available channels |
| **Data Rates and Throughput** | 3 Mbps data rate; throughput up to 2.17 Mbps |
| | Synchronous Connection Oriented links up to 3, 64 kbps, voice channels |
| | Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric or 1306.9 kbps symmetric |
| **Transmit Power** | -6 dBm to 4 dBm (Bluetooth Class II) |

## Technical Specifications

| | |
|---|---|
| **Receiver Sensitivity** | Better than -80 dBM at 0.1 % raw bit error rate |
| **Power Consumption** | Peak (Tx) 330 mW<br>Peak (Rx) 230 mW<br>Sleep <17 mW |
| **Antenna** | Internally integrated within module |
| **Range** | Up to 33 ft (10 m) |
| **Electrical Interface** | USB 2.0 compliant<br>Microsoft Windows Plug and Play compliant |
| **Bluetooth Software Supported** | Broadcom Bluetooth for Windows<br>Microsoft Windows Bluetooth Software |
| **Link Topology** | Point to Point, Multipoint Pico Nets up to 7 slaves |
| **Security** | Full support of Bluetooth Security Provisions |
| **Power Management** | Microsoft Windows ACPI, and USB Bus Support<br>Self configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff |
| **Certifications** | All necessary regulatory approvals for supported countries, including:<br>FCC (47 CFR) Part 15C, Section 15.247 & 15.249<br>ETS 300 328, ETS 300 826<br>Low Voltage Directive IEC950<br>UL, CSA, and CE Mark |
| **Bluetooth Profiles Supported** | Generic Access Profile (GAP)<br>Service Discovery Application Profile (SDAP)<br>Serial Port Profile (SPP)<br>Dial_Up Networking Profile (DUN)<br>Generic Object Exchange Profile (GOEP)<br>Object Push Profile (OPP)<br>File Transfer Profile (FTP)<br>Synchronization Profile (SYNC)<br>Hard Copy Cable Replacement (HCRP)<br>Personal Area Networking Profile (PAN)<br>Human Interface Device Profile (HID)<br>Generic Audio/Video Distribution Profile (GAVDP)<br>Advanced Audio/Video Distribution Profile (A2DP)<br>FAX Profile (FAX)<br>Basic Imaging Profile (BIP)<br>Headset Profile (HSP)<br>Hands Free Profile (HFP)<br>Basic Printing Profile (BPP)<br>VDP (Video Distribution Profile)<br>AVRCP (Audio Video Remote Control Profile) |

* Wireless access point and internet service required. Availability of public wireless access points limited.

**Intel Dual Band Wireless-AC 3160 802.11 ac (1x1) WiFi and Bluetooth 4.0 Combo* Adaptor**

**General**

| | |
|---|---|
| **Dimensions (H x W x D)** | Standard: 26.80 mm x 30.00 mm x 2.4 mm Max (Top Side) / 1.35 mm Max (Bottom Side)<br>Low profile: 22 mm x 30.00 mm x 1.5 mm Max (Top Side) / 0.6 mm Max (Bottom Side)<br>NGFF: 22 mm x 30 mm, single sided |
| **Weight** | TBD |
| **Diversity** | No diversity support |
| **Radio ON/OFF Control** | Supported in both hardware and software |

| | | |
|---|---|---|
| | **Connector interface** | Half Mini Card form factor, based on PCIe electrical interface<br>Next Generation Form Factor, A-SD electrical interface definition support |
| | **LED Output** | On/Off |
| | **Operating Temperature (Adapter Shield)** | 0° to +80° C |
| | **Humidity Non-Operating** | 50% to 90% RH non-condensing (at temperatures of 25°C to 35°C) |
| | **Operating Systems** | Microsoft Windows 7, Microsoft Windows 8, Linux |
| | **Wi-Fi Alliance** | Wi-Fi CERTIFIED for 802.11ac, Wi-Fi CERTIFIED a/b/g, Wi-Fi CERTIFIED n, WMM, WPA, WPA2, and WPS, WPS 2.0, Protected Management Frames, Wi-Fi Direct for peer to peer device connections |
| | **Microsoft WHQL** | Yes |
| | **IEEE WLAN Standard** | IEEE 802.11abgn, 802.11ac, 802.11d, 802.11e, 802.11i, 802.11h, 802.11w |
| | **Architecture** | Infrastructure and SoftAP; Supports simultaneous Client and SoftAP modes in 2.4 GHz or 5GHz |
| | **Roaming[1]** | ACPI and PCI Express compliant power management<br>802.11 compliant power saving mode |
| **Security** | **Authentication** | WPA and WPA2, 802.1X (EAP-TLS, TTLS, PEAP, LEAP, EAP-FAST), EAP-SIM, EAP-AKA |
| | **Authentication Protocols** | PAP, CHAP, TLS, GTC, MS-CHAP, MS-CHAPv2 |
| | **Encryption** | 64-bit and 128-bit WEP, AES-CCMP, TKIP |
| | **Wi-Fi Direct Encryption and Authentication** | WPA2, AES-CCMP |
| | **Product Safety** | UL, C-UL, CB (IEC 60950-1) |
| | **Management Frame Protection** | 802.11w (WFA- Protected Management Frames) |
| **Compliance** | **Retail (Credit Card Processing)** | PCI, CISP |
| | **Government** | FIPS[2],FISMA |

1. Roaming is supported only within each respective band and mode of access points.
2. Microsoft Windows 7 only.

| **HP Integrated Module with Bluetooth 4.0+EDR Wireless Technology** | |
|---|---|
| **Bluetooth Specification** | Dual Mode Bluetooth* 2.1, 2.1+EDR, 3.0, 3.0+HS, 4.0 (BLE) |
| **Dimensions** | 1.18 x 0.26 x 0.13 in (30 x 6.5 x 3.25 mm) |
| **Frequency Band** | 2402 to 2480 MHz |
| **Number of Available Channels** | 79 (1 MHz) available channels |
| **Data Rates and** | 3 Mbps data rate; throughput up to 2.17 Mbps |

## Technical Specifications

| | | |
|---|---|---|
| **Throughput** | Synchronous Connection Oriented links up to 3, 64 kbps, voice channels | |
| | Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric or 1306.9 kbps symmetric | |
| **Transmit Power** | -1.5 dBm to 4 dBm (Bluetooth Class II) | |
| **Receiver Sensitivity** | Better than -20 dBM at 0.1 % raw bit error rate | |
| **Power Consumption** | Peak (Tx) 264 mW | |
| | Peak (Rx) 231 mW | |
| | Sleep <1 mW | |
| **Antenna** | Internally integrated within module | |
| **Range** | Up 33 ft (10 m) | |
| **Electrical Interface** | USB 2.0 compliant | |
| | Microsoft Windows Plug and Play compliant | |
| **Bluetooth Software Supported** | Broadcom Bluetooth for Windows | |
| | Microsoft Windows Bluetooth Software | |
| **Link Topology** | Point to Point, Multipoint Pico Nets up to 7 slaves | |
| **Security** | Full support of Bluetooth Security Provisions | |
| **Power Management** | Microsoft Windows ACPI, and USB Bus Support | |
| | Self configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff | |
| **Certifications** | All necessary regulatory approvals for supported countries, including: | |
| | FCC (47 CFR) Part 15C, Section 15.247 & 15.249 | |
| | ETS 300 328, ETS 300 826 | |
| | Low Voltage Directive IEC950 | |
| | UL, CSA, and CE Mark | |
| **Temperature** | Operating | -14° to 158° F (-10° to 70° C) |
| | Non-operating | -40° to 212° F (-40° to 100° C) |
| **Humidity** | Operating | 0% to 90% |
| | Non-operating | 0% to 95% |
| **Altitude** | Operating | 15,000 ft (4,572 m) |
| | Non-operating | 40,000 ft (12,192 m) |
| **Bluetooth Profiles Supported** | Serial Port Profile (SPP)[1] | |
| | Service Discovery Application Profile (SDAP) | |
| | Dial-Up Networking (DUN)[1,2] | |
| | Generic Object Exchange Profile (GOEP)[1,2] | |
| | Object Push Profile (OPP)[1,2] | |
| | File Transfer Profile (FTP) | |
| | Synchronization Profile (SYNC) | |
| | Hard Copy Cable Replacement (HCRP)[1,2] | |
| | Personal Area Networking Profile (PAN)[1,2] | |
| | Human Interface Device Profile (HID)[1,2] | |
| | FAX Profile (FAX) | |
| | Basic Imaging Profile (BIP)[2] | |
| | Headset Profile (HSP) | |

Hands Free Profile (HFP)

Advanced Audio Distribution Profile (A2DP)

1. Indicates the profile is supported by Microsoft Windows XP SP2
2. Indicates the profile is part of Windows Vista

* Wireless access point and internet service required. Availability of public wireless access points limited. The specifications for the 802.11ac WLAN are draft specifications and are not final. If the final specifications differ from the draft specifications, it may affect the ability of the notebook to communicate with other 802.11ac WLAN devices.

**Intel Dual Band Wireless-N 7260AN 802.11 a/b/g/n (2x2) WiFi + Bluetooth 4.0 Combo Adaptor ***

| | | |
|---|---|---|
| **Wireless LAN Standards** | IEEE 802.11a<br>IEEE 802.11b<br>IEEE 802.11g<br>IEEE 802.11n | |
| **Interoperability** | Wi-Fi certified<br>Cisco Compatible Extensions Program compliant with Microsoft Windows 7, Windows Vista and XP (details at: http://www.hp.com/go/notebooks/WLAN) | |
| **Frequency Band** | 802.11b/g/n | 2.402 – 2.482 GHz |
| | 802.11a/n | 4.9 – 4.95 GHz (Japan)<br>5.15 – 5.25 GHz<br>5.25 – 5.35 GHz<br>5.47 – 5.725 GHz<br>5.825 – 5.850 GHz |
| **Antenna Structure** | 2 transmit; 2 receive (2x2) | |
| **Data Rates** | 802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps<br>802.11b: 1, 2, 5.5, 11 Mbps<br>802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps<br>802.11n: card will support rates for NSS=1 and NSS=2 for RX and TX for 20 and 40 MHz channels. Short and long guard interval shall be supported. | |
| **Modulation** | Direct Sequence Spread Spectrum<br>CCK, BPSK, QPSK, 16-QAM, 64-QAM | |
| **Security**[1] | • IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only<br>• AES-CCMP: 128 bit in hardware<br>• 802.1x authentication<br>• WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES.<br>• WPA2 certification<br>• IEEE 802.11i<br>• Cisco Certified Extensions, all versions through V5<br>• WAPI | |
| **Sub-channels** | Multinational support with frequency bands and channels compliant to local regulations. | |
| **Network Architecture** | Ad-hoc (Peer to Peer) | |
| **Models** | Infrastructure (Access Point Required) | |
| **Roaming** | IEEE 802.11 compliant roaming between band Access Points | |
| **Output Power**[2] | • 2.4G: +13.5dBm minimum | |

- 5G: +12dBm minimum

| | |
|---|---|
| **Power Consumption** | Transmit: 2.0 Watts<br>Receive: 1.6 Watts<br>Idle mode[3]: 250 mW (WLAN Associated)<br>Idle mode: 100 mW (WLAN unassociated)<br>Radio off: 75 mW |
| **Power Management** | ACPI and PCI Express compliant power management<br>802.11 compliant power saving mode |
| **Receiver Sensitivity**[4] | 802.11g:-90 dBm (6 Mbps), -89 dBm (9 Mbps), -87 dBm (12 Mbps), -85 dBm (18 Mbps), -82 dBm (24 Mbps), -79 dBm (36 Mbps), -76 dBm (48 Mbps), -74 dBm (54 Mbps)<br><br>802.11b:-95 dBm (1 Mbps), -93 dBm (2 Mbps), -91 dBm (5.5 Mbps), -88 dBm (11 Mbps)<br><br>802.11g:-90 dBm (6 Mbps), -89 dBm (9 Mbps), -87 dBm (12 Mbps), -85 dBm (18 Mbps), -82 dBm (24 Mbps), -79 dBm (36 Mbps), -76 dBm (48 Mbps), -74 dBm (54 Mbps)<br><br>802.11n:-69 dBm (150 Mbps), -66 dBm (300 Mbps) |
| **Antenna Connections** | 2 U.FL type connectors (output impedance of 50 ± 2 ohms) |
| **Form Factor** | PCI-Express Half-MiniCard |
| **Dimensions** | 0.12 x 1.06 x 1.18 in (3.1 x 26.8 x 30.0 mm) |
| **Operating Voltage** | 3.3V +/- 9% |
| **Temperature** | Operating: 32° to 176° F (0° to 80° C)<br>Non-operating: -40° to 176° F (-40° to 80° C) |
| **Humidity** | Operating: 10% to 90% (non-condensing)<br>Non-operating: 5% to 90% (non-condensing) |
| **Altitude** | Operating: 0 to 10,000 ft (3,048 m)<br>Non-operating: 0 to 50,000 ft (15,240 m) |
| **LED Activity** | LED Off - Radio OFF; Solid LED On - Radio ON |

1. Check latest software/driver release for updates on supported security features.
2. Maximum output power may vary by country according to local regulations.
3. In Power Save Polling mode and on battery power.
4. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CCK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).
5. WLAN supplier's client utility is required for Cisco Compatible Extensions support with Microsoft Windows XP. WLAN may also be compatible with certain third-party software supplicants. WLAN supplier IHV extensions required for Cisco Compatible Extensions support for Microsoft Windows Vista.

**HP Integrated Module with Bluetooth 4.0+EDR Wireless Technology**

| | |
|---|---|
| **Bluetooth Specification** | 4.0+EDR Compliant |
| **Dimensions** | 1.18 x 0.26 x 0.13 in (30 x 6.5 x 3.25 mm) |
| **Frequency Band** | 2402 to 2480 MHz |
| **Number of Available Channels** | 79 (1 MHz) available channels |
| **Data Rates and** | 3 Mbps data rate; throughput up to 2.17 Mbps |

## Technical Specifications

| | | |
|---|---|---|
| **Throughput** | Synchronous Connection Oriented links up to 3, 64 kbps, voice channels | |
| | Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric or 1306.9 kbps symmetric | |
| **Transmit Power** | -1.5 dBm to 4 dBm (Bluetooth Class II) | |
| **Receiver Sensitivity** | Better than -20 dBM at 0.1 % raw bit error rate | |
| **Power Consumption** | Peak (Tx) 264 mW | |
| | Peak (Rx) 231 mW | |
| | Sleep <1 mW | |
| **Antenna** | Internally integrated within module | |
| **Range** | Up 33 ft (10 m) | |
| **Electrical Interface** | USB 2.0 compliant | |
| | Microsoft Windows Plug and Play compliant | |
| **Bluetooth Software Supported** | Broadcom Bluetooth for Windows | |
| | Microsoft Windows Bluetooth Software | |
| **Link Topology** | Point to Point, Multipoint Pico Nets up to 7 slaves | |
| **Security** | Full support of Bluetooth Security Provisions | |
| **Power Management** | Microsoft Windows ACPI, and USB Bus Support | |
| | Self configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff | |
| **Certifications** | All necessary regulatory approvals for supported countries, including: | |
| | FCC (47 CFR) Part 15C, Section 15.247 & 15.249 | |
| | ETS 300 328, ETS 300 826 | |
| | Low Voltage Directive IEC950 | |
| | UL, CSA, and CE Mark | |
| **Temperature** | Operating | -14° to 158° F (-10° to 70° C) |
| | Non-operating | -40° to 212° F (-40° to 100° C) |
| **Humidity** | Operating | 0% to 90% |
| | Non-operating | 0% to 95% |
| **Altitude** | Operating | 15,000 ft (4,572 m) |
| | Non-operating | 40,000 ft (12,192 m) |
| **Bluetooth Profiles Supported** | Serial Port Profile (SPP)[1] | |
| | Service Discovery Application Profile (SDAP) | |
| | Dial-Up Networking (DUN)[1,2] | |
| | Generic Object Exchange Profile (GOEP)[1,2] | |
| | Object Push Profile (OPP)[1,2] | |
| | File Transfer Profile (FTP) | |
| | Synchronization Profile (SYNC) | |
| | Hard Copy Cable Replacement (HCRP)[1,2] | |
| | Personal Area Networking Profile (PAN)[1,2] | |
| | Human Interface Device Profile (HID)[1,2] | |
| | FAX Profile (FAX) | |
| | Basic Imaging Profile (BIP)[2] | |
| | Headset Profile (HSP) | |

| | | |
|---|---|---|
| | | Hands Free Profile (HFP) |
| | | Advanced Audio Distribution Profile (A2DP) |

1. Indicates the profile is supported by Microsoft Windows XP SP2
2. Indicates the profile is part of Windows Vista
* Wireless access point and internet service required. Availability of public wireless access points limited.

## AUDIO/MULTIMEDIA - DTS SOUND+

| | | |
|---|---|---|
| **Hardware** | **Implementation** | IDT 92HD91 |
| | **Function Key Volume Controls** | Volume up, volume down, and mute |
| | **Full Duplex** | Yes |
| | **Microphone In** | Stereo |
| | **Headphone/Line Out** | Stereo |
| | **Integrated Microphone** | Yes, dual digital microphone array when equipped with optional webcam |
| **Audio Output Quality** | **Frequency Response** | 20 Hz – 20 kHz |
| | **Signal to Noise Ratio** | >85 dB |
| | **Total Harmonic Distortion** | 0.01% |
| | **Noise Floor** | –110 dB |
| | **Play/Record Sampling Rate**(s) | 8 kHz – 48kHz |
| | **DAC** | 16, 20 or 24-bit |
| | **ADC** | 16 or 20-bit |
| **Integrated Stereo Speakers** | **Power Rating** | 2 Watts |
| | **Impedance** | 4 Ohms |

## POWER

| | | | |
|---|---|---|---|
| **HP 90W Smart AC Adapter (discrete configurations)** | **Dimensions** | 5.00 x 1.97 x 1.1 in (12.7 x 5.0 x 2.9 cm) | |
| | **Weight** | 0.84 lb (381 g) Max. | |
| | **Input** | 100 to 240 VAC | |
| | | Input Efficiency | 87% min at 115 VAC |
| | | Input frequency range | 47 to 63 Hz |
| | | Input AC current | 1.5 A at 90 VAC, 0.75 A at 180 VAC PFC Version |
| | | | 2.4 A at 90 VAC, 1.2 A at 180 VAC NON PFC Version |
| | **Output** | Output power | 90W |
| | | DC output | 19.0V |
| | | Hold-up time | 5 msec at 115 VAC input |
| | | Output current limit | <11A, Over voltage protection- 29V max |

| | | | |
|---|---|---|---|
| | | | automatic shutdown |
| | **Connector** | 3 pin/grounded, mates with interchangeable cords | |
| | **Environmental Design** | Operating temperature | 32° to 104° F (0° to 40° C) |
| | | Non-operating (storage) temperature | -4° to 149° F (-20° to 65° C) |
| | | Altitude | 0 to 10,000 ft (0 to 3,048 m) |
| | | Humidity | 20% to 80% |
| | | Storage Humidity | 10% to 90% |
| | **EMI and Safety Certifications** | CE Mark - full compliance with LVD and EMC directives; Worldwide safety standards - IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE; MTBF- over 200,000 hours at 25°C ambient condition. | |
| **HP 65W Smart AC Adapter (Configurations with integrated graphics)** | **Dimensions** | 4.17 x 1.85 x 1.1 in (10.6 x 4.7 x 2.8 cm) | |
| | **Weight** | 0.66 lb (300 g) Max. | |
| | **Input** | 100 to 240 VAC | |
| | | Input Efficiency | 87% min at 115 VAC |
| | | Input frequency range | 47 to 63 Hz |
| | | Input AC current | 1.7 A at 90 VAC, 0.85 A at 180 VAC |
| | **Output** | Output power | 65W |
| | | DC output | 18.5V |
| | | Hold-up time | 5 msec at 115 VAC input |
| | | Output current limit | <11A, Over voltage protection- 29V max automatic shutdown |
| | **Connector** | 3 pin/grounded, mates with interchangeable cords | |
| | **Environmental Design** | Operating temperature | 32° to 104° F (0° to 40° C) |
| | | Non-operating (storage) temperature | -4° to 149° F (-20° to 65° C) |
| | | Altitude | 0 to 10,000 ft (0 to 3,048 m) |
| | | Humidity | 20% to 80% |
| | | Storage Humidity | 10% to 90% |
| | **EMI and Safety Certifications** | CE Mark - full compliance with LVD and EMC directives; Worldwide safety standards - IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE; MTBF - over 200,000 hours at 25°C ambient condition. | |
| **9-Cell (93 WHr) Lithium-Ion battery** | **Dimensions** (H x W x L) | 1.57 x 1.85 x 10.59 in (4.0 x 4.7 x 26.9 cm) | |
| | **Weight** | 1.07 lb (0.488 kg) | |
| | **Cells/Type** | 9-cell Lithium-Ion | |
| | **Energy** | Watt-hour Capacity | 93 WHr |
| | | Amp-hour capacity | 8.4Ah |
| | | Watt-hour capacity | 11.1V |
| | **Temperature** | Operating (Charging) | 32° to 113° F (0° to 45° C) |
| | | Operating (Discharging) | 14° to 140° F (–10° to 60° C) |

| | | | |
|---|---|---|---|
| | | Non-operating | –4° to 140° F (–20° to 60° C) |
| | **Battery Re-Charge Time** | System in OFF mode or Standby | 3 to 4 hours |
| | | System ON | 4 to 6 hours (depending on system power consumption) |
| **6-Cell (47 WHr) Lithium-Ion battery** | **Dimensions** (H x W x L) | 0.85 x 1.76 x 10.59 in (2.16 x 4.46 x 26.9cm) | |
| | **Weight** (max) | .70lb, (.312kg) | |
| | **Cells/Type** | 6-cell Lithium-Ion | |
| | **Energy** | Voltage | 10.8V |
| | | Amp-hour capacity | 4.4Ah |
| | | Watt-hour capacity | 47Wh |
| | **Temperature** | Operating (Charging) | 32° to 113° F (0° to 45° C) |
| | | Operating (Discharging) | 14° to 122° F(-10° to 50° C) |
| | | Non-operating | -4° to 122° F (-20° to 50° C) |
| | **Battery Re-Charge Time** | System in OFF or Standby Mode | 2.5 hours |
| | | System ON | 3 to 5 hours |
| | **Fuel Gauge LED** | No | |
| | **Warranty** | 1 year | |
| | **Optional Travel Battery Available** | No | |

## ENVIRONMENTAL

## HP ProBook 440 G1 Notebook PC

**Environmental Data**

| | | | | |
|---|---|---|---|---|
| | **Eco-Label Certifications** | This product has received or is in the process of being certified to the following approvals and may be labeled with one or more of these marks:<br><br>US ENERGY STAR qualified<br>IT ECO declaration<br>EPEAT Gold | | |
| | **System Configuration** | The configuration used for the Energy Consumption and Declared Noise Emissions data is based on a "Typically Configured Notebook" | | |
| | **Energy Consumption** | 115 VAC | 230 VAC | 100 VAC |
| | Normal Operation | 6.828 W | 6.924 W | 6.372 W |
| | Sleep (Energy Star low power mode) | 0.732 W | 0.852 W | 0.804 W |
| | Off | 0.456 W | 0.432 W | 0.432 W |
| | **Heat Dissipation*** | 115 VAC | 230 VAC | 100 VAC |
| | Normal Operation | 23 BTU/hr | 24 BTU/hr | 22 BTU/hr |
| | Sleep | 3 BTU/hr | 3 BTU/hr | 0.3 BTU/hr |

| | | | |
|---|---|---|---|
| Off | 2 BTU/hr | 1 BTU/hr | 1 BTU/hr |

* Heat dissipation is calculated based on the measured watts, assuming the service level is attained for one hour.

**Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)**

| System Fan Off | Sound Power (LWAd, bels) | Sound Pressure (LpAm, decibels) |
|---|---|---|
| Idle | 3.6 | 32 |
| Fixed Disk (random writes) | 4.5 | 41 |

System fan is usually off except when charging the battery

**Batteries**

This battery(s) in this product comply with EU Directive 2006/66/EC

Batteries used in the product do not contain:

- Mercury greater the 5ppm by weight
- Cadmium greater than 10ppm by weight

The battery type and chemistry used in the product is:
CR2032 (common) (Li-MNO2) = PANDA CR2032
lithium/manganese dioxide

**Additional information**

This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive - 2002/95/EC.

This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive - 2002/96/EC.

This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).

This product is in compliance with the IEEE 1680 (EPEAT) standard at the Gold level, see www.epeat.net

Plastics parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043.

This product contains 0% post-consumer recycled plastic (by wt.)

This product is greater than 95.04% recycle-able when properly disposed of at end of life.

Packaging Materials

- External:
  - PAPER/Corrugated 51 g
  - OTHER/OTHER 20 g
  - PAPER/Cardboard & misc 325 g
- Internal:

  - PLASTIC/Polyethylene low density 15 g
  - PLASTIC/EPE-Expanded Polyethylene 68 g
  - PLASTIC/PET 20 g
- The PAPER/Corrugated packing material is made from 80 % recycled content
- The Other/Other packing material is made from 80 % recycled content
- The PAPER/Corrugated& misc packing material is made from 80 % recycled content
- The PLASTIC/Polyethylene low density packing materials contains at least 65 % recycled content
- The PLASTIC/EPE-Expanded Polyethylene packing materials contains at least 65 % recycled content
- The PLASTIC/Pet low density packing materials contains at least 65 % recycled content

HP follows these guidelines to decrease the environmental impact of product packaging:

- Eliminate the use of heavy metals such as lead, chromium, mercury and cadmium in packaging materials.
- Eliminate the use of ozone-depleting substances (ODS) in packaging materials.
- Design packaging materials for ease of disassembly.
- Maximize the use of post-consumer recycled content materials in packaging materials.
- Use readily recyclable packaging materials such as paper and corrugated materials.
- Reduce size and weight of packages to improve transportation fuel efficiency.
- Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards.

## HP ProBook 450 G1 Notebook PC

**Environmental Data**

**Eco-Label Certifications** This product has received or is in the process of being certified to the following approvals and may be labeled with one or more of these marks:

US ENERGY STAR qualified
IT ECO declaration
EPEAT Gold

**System Configuration** The configuration used for the Energy Consumption and Declared Noise Emissions data is based on a "Typically Configured Notebook"

| **Energy Consumption** | 115 VAC | 230 VAC | 100 VAC |
|---|---|---|---|
| Normal Operation | 6.252 W | 7.392 W | 6.192 W |
| Sleep (Energy Star low power mode) | 0.816 W | 0.924 W | 0.816 W |
| Off | 0.444 W | 0.456W | 0.444 W |

| **Heat Dissipation*** | 115 VAC | 230 VAC | 100 VAC |
|---|---|---|---|
| Normal Operation | 21 BTU/hr | 25 BTU/hr | 21BTU/hr |
| Sleep | 3 BTU/hr | 3 BTU/hr | 3 BTU/hr |
| Off | 2 BTU/hr | 2 BTU/hr | 0.1 BTU/hr |

* Heat dissipation is calculated based on the measured watts, assuming the service level is attained for one hour.

**Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)**

| System Fan Off | Sound Power (LWAd, bels) | Sound Pressure (LpAm, decibels) |
|---|---|---|
| Idle | 3.6 | 32 |
| Fixed Disk (random writes) | 4.4 | 40 |

System fan is usually off except when charging the battery

**Batteries**

This battery(s) in this product comply with EU Directive 2006/66/EC

Batteries used in the product do not contain:

- Mercury greater the 5ppm by weight
- Cadmium greater than 10ppm by weight

The battery type and chemistry used in the product is:
CR2032 (common) (Li-MNO2) = PANDA CR2032
lithium/manganese dioxide

**Additional information**

This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive - 2002/95/EC.

This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive - 2002/96/EC.

This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).

This product is in compliance with the IEEE 1680 (EPEAT) standard at the Gold level, see www.epeat.net

Plastics parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043.

This product contains 0% post-consumer recycled plastic (by wt.)

This product is greater than 96.44% recycle-able when properly disposed of at end of life.

Packaging Materials

- External:
  - PAPER/Corrugated 560.5 g

    - Others/Others 20 g
- Internal:
    - PLASTIC/Polyethylene low density 24 g
    - PLASTIC/EPE-Expanded Polyethylene 37 g
    - PLASTIC/PET 2.5 g
- The Others/Others packing material is made from 80 % recycled content
- The PAPER/Corrugated packing material is made from 80 % recycled content
- The PLASTIC/Polyethylene low density packing materials contains at least 65 % recycled content
- The PLASTIC/Pet packing materials contains at least 65 % recycled content

HP follows these guidelines to decrease the environmental impact of product packaging:

- Eliminate the use of heavy metals such as lead, chromium, mercury and cadmium in packaging materials.
- Eliminate the use of ozone-depleting substances (ODS) in packaging materials.
- Design packaging materials for ease of disassembly.
- Maximize the use of post-consumer recycled content materials in packaging materials.
- Use readily recyclable packaging materials such as paper and corrugated materials.
- Reduce size and weight of packages to improve transportation fuel efficiency.
- Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards.

## ALL MODELS

### MATERIAL USAGE

This product does not contain any of the following substances in excess of regulatory limits (for reference of these limits please refer to the HP General Specification of the Environment (**http://www.hp.com/hpinfo/globalcitizenship/environment/supplychain/gen_specifications.html**):

- Asbestos
- Certain Azo Colorants
- Certain Brominated Flame Retardants – may not be used as flame retardants in plastics
- Cadmium
- Chlorinated Hydrocarbons
- Chlorinated Paraffins
- Formaldehyde
- Halogenated Diphenyl Methanes
- Lead carbonates and sulfates
- Lead and Lead compounds
- Mercuric Oxide Batteries
- Ozone Depleting Substances
- Polybrominated Biphenyls (PBBs)

## Technical Specifications

- Polybrominated Biphenyl Ethers (PBBEs)
- Polybrominated Biphenyl Oxides (PBBOs)
- Polychlorinated Biphenyl (PCB)
- Polychlorinated Terphenyls (PCT)
- Polyvinyl Chloride (PVC) – except for wires and cables, and certain retail packaging has been voluntarily removed from most applications.
- Radioactive Substances
- Tributyl Tin (TBT), Triphenyl Tin (TPT), Tributyl Tin Oxide (TBTO)
- Nickel finishes that release greater than 0.5 µgrams/$cm^2$/week, measured according to EN 1811:1998, are not used on any product surface designed to be frequently handled or touched by users.

**END-OF-LIFE MANAGEMENT AND RECYCLING**

Hewlett-Packard offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: **http://www.hp.com/go/reuse-recycle** or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner.

The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard web site at: **http://www.hp.com/go/recyclers**. These instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers who integrate and re-sell HP equipment.

**HEWLETT-PACKARD CORPORATE ENVIRONMENTAL INFORMATION**

For more information about HP's commitment to the environment:

Global Citizenship Report
**http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html**
Environment website
**http://www.hp.com/environment**
Eco-label certifications
**http://www.hp.com/hpinfo/globalcitizenship/environment/productdesign/ecolabels.html**
ISO 14001 certificates:
**http://www.hp.com/hpinfo/globalcitizenship/environment/operations/envmanagement.html**

## Country of Origin

China

## Options and Accessories (sold separately and availability may vary by country)

| Type | Description | Part # |
|---|---|---|
| ***Cases*** | HP Business Top Load (up to 15.6") | H5M92AA |
| | HP Business 4 Wheel Roller Case | H5M93AA |
| | HP Business Backpack (up to 17.3") | H5M90AA |
| ***Docking*** | HP LCD Monitor Stand | QM196AA |
| | HP Dual Hinge Notebook Stand | AW661AA#xxx |
| | HP USB 2.0 Port Replicator | H1L07AA#xxx |
| | HP USB 3.0 Port Replicator | H1L08AA#xxx |
| ***Input/Output – Mice*** | HP Wireless Mobile Mouse | H2L63AA |
| | HP X4000b Bluetooth Mouse | H3T50AA#xxx |
| ***Input/Output – Keyboards*** | HP USB Essential Keyboard/Mouse | H6L29AA |
| | HP Stylish Wireless KB/Mouse | H4B79AA |
| ***Memory*** | HP 2GB DDR3L-1600 1.35V SODIMM | H6Y73AA#XXX |
| | HP 4GB DDR3L-1600 1.35V SODIMM | H6Y75AA#XXX |
| | HP 8GB DDR3L-1600 1.35V SODIMM | H6Y77AA#XXX |
| ***Adapters*** | 90W Slim Combo Adapter | H4A41AA#xxx |
| | 90W w/USB Universal Adapter | H4A43AA#ABA |
| | 90W Smart Auto/Truck Adapter | ED493AA |
| | HP 65W Slim Adapter | AX727AA#XXX |
| ***Security*** | HP Notebook Combo Lock | AY475AA#XXX |
| | HP UltraSlim Keyed Cable Lock | H4D73AA |
| ***Storage - External Storage*** | HP Mobile USB DVDRW Non-LS | A2U57AA |
| ***Monitors*** | HP EliteDisplay E231 23-inch LED Monitor | C9V75AA/A8/AS/AT |
| | HP LA1956x 19-inch LED Monitor | A9S75AA/A8/AS/AT |
| | HP LA2405x 24-inch LED Monitor | A9P21AA/A8/AT |
| | HP ProDisplay P221 21.5" LED Monitor | C9E49AA/A8/AS/AT |
| | HP ProDisplay P201 20" LED Monitor | C9F26AA/A8/AS/AT |

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